SP 392203

Duktiles semi-finished material on iron chrome aluminum basis and its use as substrate for catalysts

The invention concerns a duktiles metallic semi-finished material after the generic term of the patent claim 1.

From the DE-OS 36 21 569 and the DE-OS 38 13 685 is stainless foils or volumes on iron chrome aluminum basis well-known for use as substrate for catalysts, in particular in automotive technology. For this application as thin a volumes as possible are aimed at, in order to be able to reach as large a surface on small area as possible. The typical thickness is with approximately 50 mu M. The volumes or foils must be sufficient duktil, in order to make the close bending radii possible necessary with the production of Katalysatorträgern. Besides they must exhibit a high Oxidationsbeständigkeit. For this volumes or foils with a high aluminum content are necessary, as them admit from the already above-mentioned disclosure writings are.

In the DE-OS 36 21 569 as procedure for the production despite the high aluminum content of a duktilen chrome aluminum ferrous alloy fast deterring of the melt at a moving heat sink is described. The crystal growth is limited by the fast deterrence and the training of mechanically brittle phases is shifted to higher aluminum and chrome contents.

In the DE-OS 38 13 685 described foils after conventional kind by a usual fusion procedure, followed by pouring as block or by continuous casting as slab, hot-rolling and cold-rolling were manufactured.

Due to the high application temperatures in the catalyst must be counted with the well-known foils or volumes however on a Kornvergröberung by recrystallisation during the enterprise. Such Kornvergröberung decreases the ductility of the material. Besides inevitable impurities at the grain boundaries enrich themselves and lead to a further embrittlement. This has the consequence that losses of the catalyst occur by the very high mechanical load during the enterprise by the exhaust stagnation pressure and mechanical vibrations.

Task of the invention is it in such a way to improve the well-known foils or volumes on iron chrome aluminum basis that also at high temperatures, as they arise for example with the enterprise of the catalyst an embrittlement of the material is avoided by Kornvergröberung in consequence by recrystallisation. The task is solved by the characteristic characteristics of the patent claim 1.

For the determination of the microscopic roughness according to the DIN standard 4768 a single measuring section is not at the basis put of any more than 1 mm. It is reached by the microscopic roughness existing at at least a side of the volume or the foil that the grain boundaries in the locally thinner places of the material get stuck (Pinning). Thereby a Kornvergröberung by recrystallisation and thus an embrittlement are avoided during the enterprise also with operatings temperature above 1000 DEG C. The microscopic roughness of the semi-finished material must more largely than 0.3 mu m, favourable-proves than 0.5 mu m to be larger.

In order to ensure a good Oxidationsbeständigkeit, an aluminum content of 8% is more favourable and. The foils or volumes according to invention can be manufactured by the fact that the microscopic roughness in an additional processing step by mechanical roughening up or through points of laser is manufactured. In the case of production of a

volume by fast deterring directly from the melt at a moving heat sink the microscopic roughness without additional process steps can be produced. The desired microscopic roughness can be achieved then for example by suitable choice of the speed of the moving heat sink, whereby the roughness is caused on one side by bubbles, which are drawn in between volume and heat sink. It can be achieved further by a suitable surface finish of the heat sink.
On the basis the figures and the remark examples the invention is more near described in the following. Show:

Fig. 1 the process of the roughness of a volume according to invention manufactured by high-speed deterrence
Fig. 2 the structure of a semi-finished material according to invention after a glow treatment of 1 hour with 1100 DEG C at air
Fig. 3 the structure of a semi-finished material after the state of the art after an annealing of 1 hour with 1100 DEG C at air

A set of alloys on iron chrome aluminum basis with different life span-extending additives in different concentration was manufactured. The respective portions of chrome, aluminum and life span-extending additives X in Gew. - % are listed in table 1 (remainder in each case iron). The volumes were manufactured in the rapid staring technology with a single feeder casting process. They were subjected different glow treatments, in order to examine the oxidation characteristics and the Rekristalli sation. In table 2 iron chrome aluminum basis alloys with an Ce-additive are listed. For the evaluation of the Oxidationsbeständigkeit the time is indicated, after which a Gewichtszunahme of 10% occurred by oxygen admission with an annealing of 1200 DEG C at air. A very good Oxidationsbeständigkeit is reached with such material, a chrome portion of no more than 25 Gew. - % and an aluminum portion of not less than 8 Gew. - % exhibits. Suitable volume thicknesses for the use in catalysts extend from approximately 15 to 100 mu M. The values in table 2 prove that with such foils a relative mass increase is reached at least by oxidation from less than 10% to one 100-stündigen annealing at air.
Since a coarsing of the structure can lead by recrystallisation to an embrittlement of the material, the volumes and Foien according to invention exhibit a microscopic roughness of at least 0.3 mu m, preferably at least 0.5 mu m, at at least a side of the semi-finished material.
Fig. 1 shows the typical process of the measured microscopic roughness of a directly poured volume on the roller contact side. For the production of the roughness by the air boundary layer aimed bubbles were drawn in.
Fig. the structure of a semi-finished material according to invention with a chrome portion of 22 Gew shows 2. - % and an aluminum portion of 8 Gew. - % after a glow treatment of 1 hour with 1100 DEG C at air. By the microscopic roughness according to invention of the volume of at least 0.3 mu m a Kornvergröberung is avoided by recrystallisation.
To the comparison is in Fig. 3 the structure of a conventionally rolled iron chrome aluminum volume with a chrome portion of 23 Gew. - % and an aluminum portion of 5 Gew. - % darge places. This volume knows a microscopic roughness of less than 0.3 mu

m up. After a glow treatment of 1 hour with 1100 DEG C at air a clear Kornvergröberung is recognizable by recrystallisation. This Kornvergröberung leads to an embrittlement of the volume.

With the foils and volumes according to invention it is thus possible to manufacture Katalysatorträger with improved characteristics in the enterprise. They contribute to a decrease of the failure rate of waste gas catalysts.

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1. Duktiles, metallic semi-finished material in the form of foils or volumes, that essentially from iron, 10 to 30 Gew. - % chrome, 4 to 15 Gew. - % aluminum and 0.005 to 1 Gew. - % life span-increasing additives like rare one ground connection, Y, Ti, Zr, Hf, Nb, approx., it exists Ba, mg, by the fact characterized that the semi-finished material > at least on one side a microscopic surface roughness of RA; 0,3 mu m exhibits.
2. Semi-finished material after patent claim 1, characterized by a microscopic roughness RA > 0,5 mu M.
3. Semi-finished material after patent claim 1, by the fact characterized that it no more than 25 Gew. - % chrome and not less than 8 Gew. - % aluminum contains.
4. Semi-finished material according to requirement 3, by the fact characterized that it exhibits a relative mass increase at least in oxidation from less than 10% to one 100-stündigen annealing at air at a temperature of 1200 DEG C.
5. Use of a semi-finished material after patent claim 1 as substrate in catalysts.